
Rule CIC102: The AMXT value may be too low

Finding: CPExpert has detected that the CICS region reached the active maximum tasks (AMXT value) and virtual storage was not a constraint.

Impact: This finding has a MEDIUM IMPACT on the performance of the CICS region. This rule does not apply with CICS Version 4.1.

Logic flow: This is a basic finding, based upon an analysis of the daily CICS statistics.

Discussion: The AMXT operand in the System Initialization Table (SIT) limits the total number of concurrent **active** tasks in the CICS region. All new and resumed tasks must pass the AMXT limit before CICS dispatches the tasks. CICS marks all new and resumed tasks "nondispatchable for AMXT reasons."

Each message entering the system causes a Dispatch Control Area (DCA) to be created (this logic is for CICS Version 1.7 and later versions). If the AMXT value has not been reached, CICS creates a Task Control Area (TCA). After the TCA has been created, CICS considers whether the task should be dispatched. It is at this point that the AMXT value is used; tasks are selected for dispatching only if fewer than AMXT tasks are already active (that is, they are on the active chain). (Note that journal control tasks and the terminal control task are dispatched without regard to the AMXT value.)

The AMXT value determines how far down the active chain of TCAs CICS task control will search, looking for a dispatchable task, before issuing an operating system WAIT. The AMXT operand does not control the number of tasks allowed on the active chain.

As CICS is scanning the active chain it will take action based on the code in TCATCDC. Exhibit CIC102-1¹ illustrates the actions based on the state of the task.

¹Source: IBMLINK Document ID Q361783
TITLE: HOW IS AMXT VALUE AFFECTED BY TASKS WAITING FOR JOURNAL OR FILE CONTROL?

TCATCDC	AMXT	IOCP	Dispatch	ABEND	DUMP	State
10	N	N	No	No	No	Non-Dispatchable
14	Y	N	Not AMXT	No	No	AMXT Reason Code
15	N	N	Not CMXT	No	No	CMXT Reason Code
17	N	N	PCA available	No	No	Waiting for PCA
20	N	N	Yes	No	No	Dispatchable
21	N	N	Yes	Yes	Yes	ABEND
22	N	N	Yes	Yes	No	Stall Purge
24	N	N	Yes	Yes	No	RTIMOUT Expired
25	N	N	Yes	Yes	No	DTIMOUT Expired
40	N	N	If Posted	No	No	WAIT on List
41	Y	N	If Posted	No	No	Page I/O WAIT
43	Y	Y	If Posted	No	No	I/O Event WAIT
80	Y	N	If Posted	No	No	Single Event WAIT
88	N	N	If Posted	No	No	CICS Event WAIT

CICS TASK DISPATCHER ACTIONS ON ACTIVE CHAIN

EXHIBIT CIC102-1

Tasks on the active chain waiting for I/O events, Page I/O and single event WAITs are counted for AMXT. Once the AMXT value is reached, no more tasks are eligible to be dispatched (unless they are system tasks). If no tasks are dispatched for the stall interval (ICVS), AMXT is temporarily set to 9999 and the scan is repeated to prevent a deadlock.

There are several situation in which the AMXT value may be used to limit the number of active tasks.

- Limiting the number of active tasks may be used to limit the central storage required to support the working set of the active tasks. If central storage is a system constraint, management may wish to limit the amount of central storage required to support CICS tasks. The AMXT value can be used to limit the number of active tasks and, consequently, limit the central storage required to support their working sets.
- Management may wish to limit the effect that a CICS region has on the rest of the system or on other CICS regions. For example, management may wish to limit the number of active tasks in a CICS test region. By limiting the number of active tasks in the test region, management can control the resources consumed by CICS testing.
- AMXT can be used to control the use of virtual storage by the Dynamic Storage Area (DSA). When the number of dispatchable

tasks reaches the AMXT value, tasks on the active chain are not dispatched. Consequently, the tasks generally have little associated storage, or their storage is likely to be paged out of central storage. The AMXT value can be particularly useful if there are a number of long-running tasks and the MXT value cannot be successfully used to limit the amount of virtual storage used by the tasks.

There are a number of disadvantages to limiting the maximum number of active tasks.

- CICS performance can be unnecessarily degraded if the AMXT value is used to restrict the number of concurrent active tasks, and if the system is capable of handling more tasks.
- Tasks are selected from the dispatchable chain based upon priority. Active tasks may not be dispatched because they are waiting for some event, such as waiting on I/O completion. If the AMXT value is too low, it is possible that no tasks are dispatched even though low-priority dispatchable tasks may be on the active chain.
- A temporary lockout can occur if the AMXT value is set too low in an environment where tasks are dependent upon the completion of events processed by other tasks. For example, one task might attach another task and then wait for the completion of an event processed by the attached task. This situation is known as a "maximum active stall condition" and may seriously degrade performance.

(The situation can be prevented by specifying a sufficiently high AMXT value. Alternatively, the situation can be prevented by assigning tasks that wait on events from other tasks to a task class and specifying a CMXT value that is lower than the AMXT value.)

The CICS statistics report only the number of active tasks reached. The statistics do not report how many times the AMXT value limited the number of active tasks. CPExpert produces Rule CIC102 if the CICS statistics reported that number of maximum active tasks was as large as the AMXT value, and CPExpert did not detect a virtual storage constraint. **Note that a central storage constraint may have existed but would have been undetectable from the CICS statistics.**

You may have set the AMXT value to specifically limit the number of tasks, and may not wish CPExpert to provide notification that the AMXT value was reached. This rule is applied only if **%LET AMAXTASK = Y**; is specified in USOURCE(CICGUIDE). You can "turn off" this rule by specifying **%LET AMAXTASK = N**; in USOURCE(CICGUIDE).

Suggestion: CPExpert suggests that you consider increasing the AMXT value in the SIT. An effective way of finding the appropriate setting of the AMXT value is to try a range of values during peak system times while monitoring the system's use of the processor and storage.

Note that the AMAX value may have been set to restrict the amount of central storage used by CICS transactions. There is no information in the CICS statistics to indicate whether central storage is a constraint. If central storage is a constraint to overall system performance, the above suggestion to increase the AMXT value should be ignored.

NOTE: The significance of this finding depends upon whether the finding is based upon analyzing daily information or based upon analyzing historical information.

- If this finding is based upon an analysis of daily information, the finding may be applicable only to the performance of CICS for this day. Unless you feel that the analysis is generally applicable (or unless the workload processed on this day is particularly critical), please wait until CPExpert performs an analysis of historical information before taking action.
- If this finding is based upon an analysis of historical data covering a prolonged period, the finding is more definite than a tentative finding based upon analysis of only a single day's data.

Reference: *CICS/OS/VS Version 1.7 Performance Guide*: pages 48 and 195.

CICS/MVS Version 2.1.2 Performance Guide: pages 238 and 376.

CICS/ESA Version 3.1.1 Performance Guide: pages 53 and 296.

CICS/ESA Version 3.2.1 Performance Guide: pages 192 and 271.

CICS/ESA Version 3.3.1 Performance Guide: pages 202 and 291.

CICS/ESA Version 4.1.1: not applicable

CICS Transaction Server for OS/390: not applicable

CICS/TS for z/OS: not applicable

IBMLINK, Document Q361783.